Risks and Threats of Social Media Websites: Twitter and the Proana Movement.

Questa è la versione pre-print (prima bozza) dell'articolo "Risks and threats of social media websites: Twitter and the pro-Ana movement" degli autori Bert F, Gualano MR, Camussi E, Siliquini R., pubblicato come Original Paper sulla rivista Cyberpsychology, behaviors and social networking.

Title:

Risks and threats of social media websites: Twitter and the pro-Ana movement

Authors:

Bert F[1], Gualano MR[1], Camussi E[1§], SiliquiniR[1]

Affiliation:

[1] Department of Public Health Sciences, University of Turin, Italy

Corresponding Author:

[§]Elisa Camussi, MD,

Department of Public Health Sciences, University of Turin

via Santena 5 bis, 10126 Turin, Italy

tel. +390116705817

fax +390116705889

mail: elisa.camussi@unito.it

Acknoledgments

The authors declare that they have not received grants or funding for this work.

Conflict of Interest

The authors declare that they have no competing interests.

Abbreviation:

AN – Anorexia Nervosa

EDNOS –Eating Disorder Not Otherwise Specified

ED – Eating Disorder

ABSTRACT:

Background: In recent years,there was a spread of "pro-anorexia" websites.

Objective: The aim of our study is to investigate the presence, popularity and content of the "proana" accounts on Twitter.

Methods: On January 2015, we used "Twitter Search" to retrieve the "proana" accounts.For each account, we analyzed the number of followers, tweets and the biographical information of the users. We followed these accounts for four weeks, assessing the variations in followers and tweets. We also investigated the most used hashtags and the main contents of these profiles.

Results: Finally, we retrieved 341 accounts. These accounts were popular (mean followers: 2360.9, range: 5-32,700) and active (mean tweets: 4,351.2, range: 5-85,700). The users were mostly girls (97.9%), in general teenagers (mean age: 17.9 years, range: 12-28). Only around 6% of the accounts presented a warning text about the dangerous content. Each week we found a mean increase in both followers and tweets. The five most used hashtags resulted in descending order: "thinspo", "thinspiration", "Thin15", "EDprobs" and "proana".The most commonlyused contents were in order: autobiographic, "thinspiration" photos (inspirational photos of extremely thin girls), "thinspiration" quotes (motivational mottos), "ana tips" (advices for weight loss) and "fasting competition".

Discussion: We underlined a concerninghigh number and popularity of Twitter pro-anorexia groups. These accounts contain dangerous information, especially considering the young age of the users. Given the lack of warnings in almost all the accounts, a first step to control this phenomenon could be the increase of such written alerts.

Keywords:

Twitter; anorexia; Social network; health risks

Implication-contribution:

The number and popularity of pro-anorexia accounts appear concerning, especially considering the young age of the users. Therefore, the surveillance of this harmful content on Twitter seemed inadequate. A first step toward the control of these accounts could be represented by the increase in Twitter warnings.

Introduction

Anorexia Nervosa (AN) is a relatively common eating disorder, especially in developed countries, reaching an estimated lifetime prevalence between 0.5 to 2% and affecting more frequently adolescent girls in the age group between 13 to 18 years old [1, 2]. The majority of patients, indeed, are girls, while about 10% are boys [1].The prevalence of the Eating Disorder Not Otherwise Specified (EDNOS), a heterogeneous group that mainly includes incomplete forms of Anorexia Nervosa and Bulimia Nervosa, is even higher (4.8% among adolescents) [9,10]. Over the last years, the incidence of anorexia increased significantly in this high-risk group, although the overall incidence rate remained stable [3, 4, 5]. Anorexia is a very serious and even life-threatening psychiatric illness with a mortality rate of 5 to 6%, higher than all other mental disorders [6, 7, 8]. These data highlighted the importance of an early diagnosis and a solicitous treatment of anorexia [8].

Anorexics often try to keep secret their medical condition [11]; this social isolation makes Internet the perfect tool to search support and advice [11-13]. In this regard, a study of 2003 stated that the number of communities and websites supporting anorexia, also called "pro-ana" websites, exceeds by far that of pro-recovery websites [13, 14, 15]. The growing popularity of such online communities among young people is extremely concerning [16]. Indeed, in a 2009 survey conducted in Belgian schools, Custers et al. underlined that more of 12% of girls viewed at least once one of this websites while only less than 6% of boys visited these online contents [16].

In recent years, different studies analyzed the spread of pro-eating disorders groups on Internet [14-17], focusing in particular on social media such as Facebook, Myspace [18], YouTube [19] and Flickr [20]. The potential harmful effect of this online content has been studied in both healthy subjects and anorexics [21, 22]. In particular, Rouleau et al. in their review summarized the harmful effects of this online content in three major categories: social support related to the maintenance of the eating disorder, encouragement of pathological behaviors and impediment to recovery [22]. One of the most dangerous content is represented by the "tips and tricks" sections [22], where users share information on how to reach an extreme weight loss, for example by purging and fasting [22, 23]. Another common content of these websites is the so-called "thinspiration" where users post quotes and photos, mainly of skeletal girls or models, used as an inspiration and an encouragement to thinness [20,24]. Jett et al. underlined the negative effect of pro-eating disorders websites also in healthy girls; indeed, even a modest exposure to this content, can cause a change in the eating habits and the caloric intake of the viewers [25].

This issue related to online communities become more and more revelant among the users of one of the most widespread social media, especially among young people, called Twitter [27, 28, 29].

Recent studies investigated the role of Twitter as a source of health information [30], focusing on different topics such as antibiotics use [30], vaccinations [31] and chronic diseases [32].

However, to our knowledge, there have been no previous studies on Twitter pro-eating disorders accounts. The present study aims then to investigate the prevalence, popularity and contents of these communities on Twitter. This investigation is particularly important given the young age of the main Twitter users, which is precisely the population at increased risk for the onset of eating disorders. Besides, we aimed to describe the socio-demographic characteristics of the account creators and even the temporal evolution of these profiles. Finally, we intend to compare the accounts characteristics according to popularity and socio-demographic information.

Methods

We investigated the pro-anorexia Twitter contents from the 8th January to the February 17th, 2015. We used "Twitter search", a tool available on Twitter, in order to filter the accounts publishing tweets according to specific key words (named hashtags) related to pro-eating disorders: "proana", "thinspiration" and "thinspo". These words were selected because they were identified in previous studies as frequently used among the online pro-anorexia community [18, 33]. We only considered the accounts in English, Spanish and French. The "anti-proana" accounts were excluded. For each account selected, we identified the number of followers, tweets and photos. Then we collected, when available, the personal data of the account creators such as sex, age, country, comorbidity and weight (considered as current and target weight). Since these personal data are not compulsorily on Twitter, only some users disclosed them. We also considered the presence or absence of warnings about the content of the accounts.

It should be recognized that Twitter, and in general Internet, is by nature extremely dynamic. Hence, in order to analyze even the time evolution of the selected profiles, we monitored them once a week for overall four weeks. We noted the changes in the number of followers, tweets, photos or any change of status of privacy setting. We also studied the most used hashtags among this online community and the main contents of these accounts. In the content analysis, we outlined a limited number of key repeated topics. In particular, we summarized the content of these accounts in five main categories: autobiographical information, "ana tips", "thinspiration" photos, "thinspiration" quotes and fasting competition. In order to identify any difference between the accounts retrieved, we compared the accounts features according to popularity and socio-demographic data of users.

Despite human subjects were not involved in the study, the present research obtained the ethical approval by the Institutional Review Board of the Department of Public Health Sciences, University of Turin.

Statistical Analysis

For the statistical analysis of the retrieved data, we used Stata MP11 (Stata Corp., College Station, TX, 2011). The continuous variables, such as the number of followers and tweets, are expressed in terms of mean or median with range. We reported the frequencies in terms of absolute numbers and percentages. In order to assess the relationship between popularity, socio-demographic characteristics and accounts contents, a Chi Square test was used and the Fisher correction was applied when required. A p value ≤.05 was considered statistically significant.

Results

Our search identified 341 Twitter pro-anorexia profiles. Table 1 describes the overall characteristics of the 341 pro-anorexia accounts retrieved at the first observation. The mean number of followers was 2360.9 (median: 668; range: 5-32,700). The mean number of tweets was 4351.2 (median: 1345; range: 5- 85,700). We found a wide range of followers and tweets; however the 90.3% (n=308) of the accounts had more than 100 followers and the 93.8% (n=320) posted more than 100 tweets. Since one of the main activities of these accounts was sharing photos, we considered also the mean of photos for profile 302.5 (median: 64; range: 0-8,960).The 95.9% (n=327) of the users posted at least one photo and the 41.1% (n=140) more than 100. As expected, the more popular accounts (≥ 100 followers) are also more active (≥ 100 tweets; p <.001) and shared more photos (≥ 100 photos; p < .001) compared to the less popular accounts (< 100 followers).

Only 20 accounts (5.9%) presented a warning text about the dangerous content of the pages in the status description. The accounts without any warnings presented a significant larger amount of profiles with more than 100 followers than those with such messages (p=.008).

Regarding the socio-demographic features of the accounts creators, we found that 94.7% (n=323) self-identified as female. Only 83 users (24.3%) declared their nationality. The most represented Countries resulted: USA (n=24; 28.9%), UK (n=22; 26.5%), Canada (n=9; 10.8%), France (n=8; 9.6%) and Netherlands (n=5; 6.0%). The 24.3% (n=83) of the users indicated their age, with a mean reported age of 17.9 years old (range: 12-28).In particular, the 72.3% (n=60) declared 18 years or less. We found no significant difference in terms of followers (p = .31), tweets (p = .57) and photos (p=.46) between ≤ 18 years and older users accounts.

Moreover, around 21% of users (n=71) indicated in their biography the presence of at least one psychiatric comorbidity, especially depression and self-harm attitudes (Supplementary File 1 - Table 1a). Not very relevant was the indication of the weight in the biographies, for both the limited number of accounts who reported this data (n=94; 27.6%) and the wide range of weight declared

(from 35 to 102 kg). Among the users who reported their weight, 23 (24.5%) quoted a weight lower than 50 Kg. Interestingly, around 130 users (38.1%) indicated the "target weight" they wanted to achieve with a mean reported weight of 43.2 kg (range: 0-63 kg).

We retrieved only seven male profiles with a mean of 298.1 followers (range: 10-1491), 901.3 tweets (range: 7-4561) and 85.1 photos (range: 0-546). Four of these accounts had more than 100 followers and posted more than 100 tweets, while only one shared more than 100 photos. None of these users indicated their age and only one presented a warning about the content. Regarding the current weight, only one of the boys reported it (40 Kg). Male profiles presented a significant lower number of followers ($p = .02$) and tweets ($p = .02$) compared to girls.

Time evolution of the accounts

We analyzed the temporal evolution of these profiles, by observing each of them once a week for a total observation time of four weeks (Table 2). At the end of the follow-up period 304 accounts (89.1%) were still active and without restrictions in their visibility. Table 2 indicated the mean number of followers, tweets and photos in each week. Analyzing the variation in the number of followers, tweets and photos during the different periods of follow-up, we observed for all these items a mean increase, as shown in Table 2.

Accounts lost to follow up

During our observation, 37 profiles (10.9%) changed their visibility. Specifically, 11 modified their privacy setting as private (3.2%) and 26 shut down (7.6%). Therefore, we could not follow and monitor them for the total observation time. We noticed some characteristics of these accounts (Supplementary File 1 - Table 2a): they were quite popular (mean of followers: 3138.9) and active (mean of tweets: 4595.3; mean of photos: 328.4). None of them presented any warning about the content, only nine users (24.3%) expressed their age (mean age: 17.7 years) and 10.8% (n=4) indicated some psychiatric comorbidity. We found no significant difference between the accounts lost to follow up and those that did not change status during observation in terms of followers ($p = .77$), tweets ($p = 1$) and photos ($p = .22$).

Most used hashtags

In order to consider the most widespread keywords among the potential users of these accounts, we considered the five most used hashtags (#) among the initial sample of "proana" Twitter accounts (Table 3). The most common hashtag was "thinspo" (abbreviation of "Thin Inspiration") used by 162 users (47.9%), followed by "thinspiration" found in 55 accounts (16.3%), "Thin15" in 40

accounts (11.8%), “EDprobs” (Eating Disorders problems) in 31 profiles (9.2%) and “proana” in 28 accounts (8.3%). Lower percentages were found for other hashtags, such as “bonespo”, “ana tips”, “anamia”, “abcdiet”,“thigh gap” and “Love my ED”.

Analysis of contents

We classified the tweets contents in five categories in order to define the frequency of the main topics in all the accounts included in the initial sample (Table 3). The five categories with their respective frequency were:

1. Autobiographical content (information about private life, personal food diary, weight statistics and description of own pathological behaviors), found in 289 accounts (86.0%);

2.“Thinspiration” photos (photos of very thin models and emaciated girls used as an inspiration in losing weight, but also photos of obese people, called as “reverse thinspiration”, used as a trigger not to eat), retrieved in 228 profiles (67.9%);

3.“Thinspiration” quotes (mottos used as a motivation to weight loss), shared by 57 users (17.0%);

4. “Ana tips” (tips and tricks to lose weight such as diet, fasting or purging methods), retrieved in 22 profiles (6.5%);

5.“Fasting competition” (competition among users in weight loss and fasting with a specific regulation and distinction in teams), found in 0.9% accounts (n=3).

Table 4 shows some examples of tweets categorized in the five main topics previously mentioned.

We found no statistical difference ($p > 0.05$) in accounts contents related to the number of followers ($\geq$ or < 100), the change of status during follow-up, the warnings presence or the age of the users. The more active accounts (≥ 100 tweets) presented more “thinspiration” photos ($p < .001$), but less “ana tips” content ($p = .01$) than the accounts with less than 100 tweets. As expected, the accounts with more than 100 photos presented a significant larger content of “thinspiration” photos ($p <.001$) than those with less images shared. Finally, the girls profiles presented a larger amount of “thinspiration” photos content ($p = .005$) than boys, while no other difference of content were found.

Discussion

In recent years, different studies outlined the growing popularity of “pro-anorexia” websites and even their potential harmful effects [11-25]. Our study aimed to investigate the spread and the topics of the “pro-anorexia” accounts on Twitter. To our knowledge, this is the first study that

highlights the diffusion of “proana” contents on this social media. First, our search pointed out the easiness to retrieve these online accounts. Indeed, using a limited number of keywords on “Twitter search”, we found over 300 “proana” accounts, showing an alarmingly high popularity in terms of followers. In particular, nearly all the accounts considered had more than 100 followers at first observation. It must be acknowledged that, considering only the number of followers, the real popularity of these accounts could be even underestimated since some users can visit the profiles without registering. However, we did not find any difference of content related to the account popularity. The accounts retrieved were also very active, in as much we observed in general a high rate of tweets and photos per week. Indeed, in our 4-weeks follow-up, the considered accounts showed a mean increase in terms of both followers and tweets. Even the accounts closed during our observation were quite popular and they did not significantly differ from the other observed accounts. Hence, from our analysis, the “pro-ana” Twitter community appear very dynamic and with ever-changing contents.

From the analysis of the biographical data of the account creators, we found a young age of the users, in agreement with the great popularity of Twitter among adolescents [26, 27]. The majority of the users that indicated their age were actually teen-agers or less, with a lowest reported age of just twelve years old. Since epidemiology outlined a progressively earlier onset of eating disorders in the last years [1-5], this uncontrolled use of the social media can be particularly dangerous among these young kids, especially considering that adolescents are particularly susceptible to problematic health behaviors [34]. As expected, according to the epidemiology of eating disorders [1, 2], nearly all the accounts retrieved were managed by girls. We found only a limited number of boys accounts and they turned out to be far less popular and active than girls. It could be interesting to retrieve a larger number of male accounts in way to make a comparison with girls, even considering the increasing incidence of such diseases among males [1, 2].

Our analysis outlined that the five more popular hashtags among this community corresponded to those known as keywords to retrieve the websites [18, 33]. Moreover, also the prevalent themes on Twitter coincided with those found on “proana” websites [14, 24]. In particular, almost all the users shared in their accounts personal information and eating disorder related experiences. In this way, a stronger bond between users can be established. The sharing of “thinspiration” pictures resulted alarmingly common on Twitter; indeed these photos can be retrieved in more of 60% of the accounts. Also, the sharing of photos and motivational quotes promote the development of a sense of community between the users.

Different studies individuated the most risky content of “proana” websites in the sections describing pathological weight loss tricks [21, 22, 23, 25]; indeed through these sections users can learn new

and dangerous strategies to loss weight. Our research identified the presence of such topics also on Twitter with diet and purging advices. Over the 6% of the accounts retrieved presented such type of content, a lower proportion than that reported by Borzekowski et al. (43%) or by Norris et al. (67%) for the websites [12, 24]. However, considering the harmfulness of these topics, especially for the youngsters, parents and caregivers must be aware of these online contents. On the contrary, Wilson et al. in their survey highlighted the lack of awareness of most of the interviewed parents about pro-anorexia websites [17].Moreover, our analysis highlighted how some of the accounts shared other dangerous contents such as those self-harm related.

In accordance with the findings of Jurascio et al. [18], even on Twitter the main reported reason to the use of social media is the search of an online support that could not be found in "real life". However, this online support can be counterproductive because it risks to forward the pathological behaviors and in some way normalize them. In addition, this online activity can represent an obstacle to recovery from eating disorders.

Further, our analysis outlined the scarce use of warnings on Twitter (about 5% of the accounts), in contrast to that observed in other websites (over 50% of such web pages) [14]. We did not find any difference in terms of dangerous content ("thinspiration" photos, "ana tips", "thinspiration quotes" and fasting competition) between accounts with or without warnings, while the accounts with such messages presented a lower number of followers. As previously stated by Martijn et al., the effectiveness as a deterrent of such warnings is possible [35], so it could be usefulto recommend an increase of their use even on Twitter. This could be a first and easy step towards a greater control of these online "risky" contents.

A limitation of our study is that some of the accounts were private and we could not access to the material shared in these pages. It is likely that exactly in these accounts the users shared the most harmful content, hiding it from non-followers. Furthermore, these communities try to hide themselves in order to avoid the censorship, so they are continually evolving making still more difficult to whom not belonging to these online communities to retrieve them. Since the dynamic nature of Internet, everyday new pro-eating disorders accounts can be created all over the world. Therefore, our study represents a picture referred to a precise moment of observation.

It would be interesting in further studies to find out even the "anti-proana" and "pro-recovery" accounts and to compare them to the "proana" accounts, in terms of popularity, activity and contents.

Conclusions

The growing popularity of possibly harmful online content is becoming an urgent public health issue. Since the potentialities of social media in health promotion are well known [36, 37], it could be worthwhile to implement some online preventive program. Indeed, an online service can provide psychological support and effectively address people to recovery, as Internet often represents the first step towards a help-seeking even offline. Since Internet is increasingly used as a source of health information [38-40], it is particularly important to improve the surveillance about the spreading of health misinformation online also in social media. Moreover, as the majority of the users were students, it can be useful to implement an educational program about nutrition in schools, focusing also on the correct use of social media and their potential harmful effects.

In summary, anorexia nervosa is a very serious and even life-threatening disease [1, 7, 8], so it is very important to individuate this online content and increase the awareness about these dangerous online topics in both young people and parents. Further, our analysis highlighted the importance of a more active surveillance system on Twitter content.

References

1. Sigel E. Eating disorders. Adolesc Med State Art Rev. 2008 Dec;19(3):547-72, xi. Review.PubMed PMID: 19227391.

2. Weaver L, Liebman R. Assessment of anorexia nervosa in children and adolescents. Curr Psychiatry Rep. 2011 Apr;13(2):93-8.doi: 10.1007/s11920-010-0174-y. Review. PubMed PMID: 21221860.

3.Van Son GE, van Hoeken D, Bartelds AI, van Furth EF, Hoek HW.Time trends in the incidence of eating disorders: a primary care study in the Netherlands. IntJEatDisord. 2006 Nov;39(7):565-9.PubMed PMID: 16791852.

4.Favaro A, Caregaro L, Tenconi E, Bosello R, Santonastaso P. Time trends in age at onset of anorexia nervosa and bulimia nervosa. J Clin Psychiatry. 2009Dec;70(12):1715-21.doi: 10.4088/JCP.09m05176blu. PubMed PMID: 20141711.

5.Smink FR, van Hoeken D, Hoek HW. Epidemiology of eating disorders: incidence, prevalence and mortality rates. Curr Psychiatry Rep. 2012 Aug;14(4):406-14.doi: 10.1007/s11920-012-0282-y. Review. PubMed PMID: 22644309.

6.Arcelus J, Mitchell AJ, Wales J, Nielsen S. Mortality rates in patients with anorexia nervosa and other eating disorders. A meta-analysis of 36 studies. Arch Gen Psychiatry. 2011 Jul;68(7):724-31.doi: 10.1001/archgenpsychiatry.2011.74. PubMed PMID: 21727255.

7.Franko DL, Keshaviah A, Eddy KT, Krishna M, Davis MC, Keel PK, Herzog DB.A longitudinal investigation of mortality in anorexia nervosa and bulimia nervosa. Am J Psychiatry. 2013 Aug;170(8):917-25.doi: 10.1176/appi.ajp.2013.12070868. PubMed PMID: 23771148.

8. Katzman DK. Medical complications in adolescents with anorexia nervosa: a review of the literature. Int J Eat Disord. 2005;37Suppl:S52-9; discussionS87-9. Review.PubMed PMID: 15852321.

9. Le Grange D, Swanson SA, Crow SJ, Merikangas KR. Eating disorder not otherwise specified presentation in the US population. Int J Eat Disord. 2012Jul;45(5):711-8.doi: 10.1002/eat.22006. Epub 2012 Mar 12. PubMed PMID: 22407912.

10.Eddy KT, Le Grange D, Crosby RD, Hoste RR, Doyle AC, Smyth A, Herzog DB.Diagnostic classification of eating disorders in children and adolescents: howdoes DSM-IV-TR compare to empirically-derived categories? J Am Acad Child AdolescPsychiatry. 2010 Mar;49(3):277-87; quiz 293.PubMed PMID: 20410717.

11. Gavin J, Rodham K, Poyer H. The presentation of "pro-anorexia" in online group interactions. Qual Health Res. 2008 Mar;18(3):325-33.doi: 10.1177/1049732307311640. PubMed PMID: 18235156.

12.Brotsky SR, Giles D. Inside the "pro-ana" community: a covert online participant observation. Eat Disord. 2007 Mar-Apr;15(2):93-109.PubMed PMID: 17454069.

13. Fox N, Ward K, O'Rourke A. Pro-anorexia, weight-loss drugs and the internet: an "anti-recovery" explanatory model of anorexia. Sociol Health Illn. 2005Nov;27(7):944-71.PubMed PMID: 16313524.

14. Norris ML, Boydell KM, Pinhas L, Katzman DK. Ana and the Internet: a review of pro-anorexia websites. Int J Eat Disord. 2006 Sep;39(6):443-7. Review. PubMedPMID: 16721839.

15.ChesleyEB, Klein JD, Kreipe RE. "Pro or con? Anorexia nervosa and the Internet." Journal of Adolescent Health2003; 32.2: 123-124.http://dx.doi.org/10.1016/S1054-139X(02)00615-8.

16.Custers K, Van den Bulck J. Viewership of pro-anorexia websites in seventh, ninth and eleventh graders. Eur Eat Disord Rev. 2009 May;17(3):214-9.doi: 10.1002/erv.910. PubMed PMID: 19142974.

17. Wilson JL, Peebles R, Hardy KK, Litt IF. Surfing for thinness: a pilot study of pro-eating disorder Web site usage in adolescents with eating disorders. Pediatrics. 2006 Dec;118(6):e1635-43.PubMed PMID: 17142493.

18.Juarascio AS, Shoaib A, Timko CA. Pro-eating disorder communities on social networking sites: a content analysis. Eat Disord. 2010 Oct-Dec;18(5):393-407.doi: 10.1080/10640266.2010.511918. PubMed PMID: 20865593.

19.Syed-Abdul S, Fernandez-Luque L, Jian WS, Li YC, Crain S, Hsu MH, Wang YC, Khandregzen D, Chuluunbaatar E, Nguyen PA, Liou DM. Misleading health-relatedinformation promoted through video-based social media: anorexia on YouTube. J MedInternet Res. 2013 Feb 13;15(2):e30.doi: 10.2196/jmir.2237. PubMed PMID: 23406655.

20.Yom-Tov E, Fernandez-Luque L, Weber I, Crain SP. Pro-anorexia and pro-recovery photo sharing: a tale of two warring tribes. J Med Internet Res. 2012 Nov 7;14(6):e151.doi: 10.2196/jmir.2239. PubMed PMID: 23134671.

21.Harper K, Sperry S, Thompson JK. Viewership of pro-eating disorder websites: association with body image and eating disturbances. Int J Eat Disord. 2008 Jan;41(1):92-5.PubMed PMID: 17634964.

22.Rouleau CR, von Ranson KM. Potential risks of pro-eating disorder websites. ClinPsychol Rev. 2011 Jun;31(4):525-31.doi: 10.1016/j.cpr.2010.12.005. PubMed PMID: 21272967.

23.Harshbarger JL, Ahlers-Schmidt CR, Mayans L, Mayans D, Hawkins JH.Pro-anorexia websites: what a clinician should know. Int J Eat Disord. 2009May;42(4):367-70.doi: 10.1002/eat.20608. PubMed PMID: 19040264.

24.Borzekowski DL, Schenk S, Wilson JL, Peebles R. e-Ana and e-Mia: A content analysis of pro-eating disorder Web sites. Am J Public Health. 2010 Aug;100(8):1526-34.doi: 10.2105/AJPH.2009.172700.PubMed PMID: 20558807

25. Jett S, LaPorte DJ, Wanchisn J. Impact of exposure to pro-eating disorder websites on eating behaviour in college women. Eur Eat Disord Rev. 2010 Sep-Oct;18(5):410-6.doi: 10.1002/erv.1009. PubMed PMID: 20572210.

26. Brenner, Joanna, Aaron Smith. "72% of online adults are social networking site users." Washington, DC: Pew Internet & American Life Project (2013).

27.Sysomos. Inside Twitter: An In-Depth Look Inside the Twitter World. Revised April 2014. Published June 2009.

28. "Twitter.com Site Info". Alexa Internet. Retrieved 2015-01-24.

29. Twitter. https://about.twitter.com/company. Accessed 2015-01-24.

30. Scanfeld D, Scanfeld V, Larson EL. Dissemination of health information through social networks: twitter and antibiotics. Am J Infect Control. 2010Apr;38(3):182-8.doi: 10.1016/j.ajic.2009.11.004. PubMed PMID: 20347636.

31. Love B, Himelboim I, Holton A, Stewart K. Twitter as a source of vaccination information: content drivers and what they are saying. Am J Infect Control. 2013 Jun;41(6):568-70.doi: 10.1016/j.ajic.2012.10.016. PubMed PMID: 23726548.

32. De la Torre-Díez I, Díaz-Pernas FJ, Antón-Rodríguez M. A content analysis of chronic diseases social groups on Facebook and Twitter. Telemed J E Health. 2012 Jul-Aug;18(6):404-8.doi: 10.1089/tmj.2011.0227. PubMed PMID: 22650380.

33.Lewis SP, Arbuthnott AE. Searching for thinspiration: the nature of internet searches for pro-eating disorder websites. CyberpsycholBehavSocNetw. 2012 Apr;15(4):200-4.doi: 10.1089/cyber.2011.0453. PubMed PMID: 22335543.

34.Gualano MR, Bert F, Passi S, Stillo M, Galis V, Manzoli L, Siliquini R. Use of self-medication among adolescents: a systematic review and meta-analysis. Eur JPublic Health. 2015 Jun;25(3):444-50. doi: 10.1093/eurpub/cku207. PubMed PMID: 25479758.

35.Martijn C, Smeets E, Jansen A, Hoeymans N, Schoemaker C. Don't get the message: the effect of a warning text before visiting a proanorexia website. Int J Eat Disord. 2009 Mar;42(2):139-45.doi: 10.1002/eat.20598. PubMed PMID: 18949766.

36.Bert F, Giacometti M, Gualano MR, Siliquini R. Smartphones and health promotion: a review of the evidence. J Med Syst. 2014 Jan;38(1):9995.doi: 10.1007/s10916-013-9995-7. PubMed PMID: 24346929.

37. Giacometti M, Gualano MR, Bert F, SiliquiniR. [Public health accessible to all: use of smartphones in the context of healthcare in Italy]. Ig SanitaPubbl. 2013 Mar-Apr;69(2):249-59.PubMed PMID: 23743704.

38. Bert F, Gualano MR, Brusaferro S, De Vito E, de Waure C, La Torre G, Manzoli L, Messina G, Todros T, Torregrossa MV, Siliquini R. Pregnancy e-health: a multicenter Italian cross-sectional study on Internet use and decision-makingamong pregnant women. J Epidemiol Community Health. 2013 Dec 1;67(12):1013-8.doi: 10.1136/jech-2013-202584. PubMed PMID: 24072743.

39. Lovato E, Bert F, Bruno S, Ceruti M, De Vito E, La Torre G, Liguori G, ManzoliL, Messina G, Minniti D, Siliquini R; Collaborative Group.[Role of the Web on behaviors and health choices in six Italian cities: results of a multicenterstudy]. Ann Ig. 2011 Jul-Aug;23(4):283-94.PubMed PMID: 22026231.

40. Siliquini R, Ceruti M, Lovato E, Bert F, Bruno S, De Vito E, Liguori G, Manzoli L, Messina G, Minniti D, La Torre G. Surfing the internet for health information: an italian survey on use and population choices. BMC Med InformDecisMak. 2011 Apr 7;11:21.doi: 10.1186/1472-6947-11-21. PubMed PMID: 21470435.

Table 1: Overall characteristics of Twitter pro-anorexia accounts

	N	Mean	Median	Range
Followers	341	2360.9	668	5-32700
Photos	334	302.5	64	0-8960
Tweets	341	4351.2	1345	5-85700
Age	83	17.9	17	12-28
Current Weight (Kg)	94	56.4	54.5	35-102
Target Weight (Kg)	130	43.2	44	0-63

We considered the number of followers, tweets, photos and the socio-demographic features of the users (age, current and target weight).

Table 2: Time changes of Twitter accounts over the four weeks follow-up

		Mean	Confidence Interval	Median
Followers	*Week1*	2266.2	(1755.3 - 2777.1)	757
	Week2	2342.1	(1825.3 - 2858.9)	824
	Week3	2373.1	(1856.7 - 2889.5)	845
	Week4	2399.5	(1880.2 - 2918.8)	871.5
	Δ Week2-week1	60.5	(25.5 - 95.6)	16
	Δ Week3-week2	26.1	(12.3 - 39.8)	11.5
	Δ Week4-week3	24.7	(18.4 - 31.1)	7
Photos	*Week1*	299.8	(211.8 - 387.7)	59.5
	Week2	299.7	(213.1 - 386.2)	63
	Week3	315.3	(226.8 - 403.8)	73
	Week4	317.7	(229.1 - 406.2)	73.5
	Δ Week2-week1	5.2	(2.1 - 8.4)	1
	Δ Week3-week2	5.4	(2.6 - 8.2)	1
	Δ Week4-week3	3.6	(1.4 - 4.8)	0
N. Tweets	*Week1*	4321.2	(3383.0 - 5259.5)	1330
	Week2	4496.8	(3533.7 - 5459.9)	1474.5
	Week3	4662.3	(3689.4 - 3635.2)	1562.5
	Week4	4714.4	(3735.9 - 5629.9)	1595
	Δ Week2-week1	116.2	(78.2 - 154.2)	31
	Δ Week3-week2	81.6	(56.9 - 106.3)	19
	Δ Week4-week3	58.9	(45.5 - 72.3)	13

We considered the variations in terms of followers, tweets, photos and variation in accounts characteristics during the observation period of four weeks, precisely between week 2 and 1, 3 and 2 and finally between 4 and 3.

Table 3: The five most popular hashtags and the most popular content in Twitter pro-anorexia accounts.

		N	%
Hashtag ***(N= 338)***	*#thinspo*	162	47.9
	#thinspiration	55	16.3
	#thin15	40	11.8
	#edprobs	31	9.2
	#proana	28	8.3
Content ***(N=336)***	*Autobiographical information*	289	86.0
	"Photo Thinspiration"	228	67.9
	"ThinspirationQuotes"	57	17.0
	Ana Tips	22	6.5
	FastingCompetition	3	0.9

The five most popular hashtags used by the Twitter pro-anorexia community and the most popular content in Twitter pro-anorexia accounts considering five main categories of content.

Table 4: Examples of Twitter pro-anorexia content according the main topics

Topic	Quotes
Autobiographic	*"Confessions of a girl suffering with ana… sw:127,6 cw:126, gw1:118, gw2:108"* *"Haven't eaten in over 36 hours. I have drank like 10 cups of tea with semi-skimmed milk & NO sugar. So about 135 cals over 36 hour. #proud"* *"Because of purging yesterday my voice is gone today. I'm screwed."* *"My mom needs to go to work so I can purge"* *"Tried recovery but it's not for me. My life. My choice"*
Thinspiration Quotes	*"The more you sweat during a workout… The less you cry on the scale"* *"You're not a dog. Don't reward yourself with food"* *"A pound a day keep the sadness away"*
Ana Tips	*"Whenever I get desperate, really craving food, I eat a 10 calorie jelly slowly. It's sweet and filling. #IWillBeThin #diet"* *"Popcorn is easy to purge."* *"Caffeine reduces hunger and gives you energy through your day."* *"Always buy clothes that are just a bit too small, so remind you not to eat"* *"You can eat 1-2 kg cucumbers per day and drink 2 L of water or green tea. You'll lose 5-6 kg per week"*
Fasting Game	*"The first round of the #FastingGame is over! Tweet and DM your team score!"* *"Fasting Games point deduction:* *-1 eating greens* *-1 eating almonds* *-4 eating meat* *-5 eating sweets (candy, cookies, cakes)* *-5 drinking less than 4 cups of water per day* *-7 eating carbs* *-10 getting less than 6 hours of sleep a night* *-15 purging (if you eat keep it down! Burn it off if you need to)"*

Table 1a: Psychiatric comorbidities indicated in the status description by "proana" users (N=71).

	Frequency	%
Self-Harm	37	52.1
Depression	36	50.7
Anxiety syndrome	16	23.9
Borderline personality	6	8.4
Bipolar syndrome	6	8.4

Table 2a: Characteristics of accounts lost at follow up

	N	Mean	Median	Range
Followers	37	3138.9	488	(55 - 32600)
Photos	32	328.4	85	(3 - 3556)
Tweets	37	4595.3	1548	(57 - 37400)
Age	9	17.7	18	(12 - 28)
Current Weight	7	58.3	58	(50 - 69)
Target Weight	11	41.5	44	(11 - 52)